

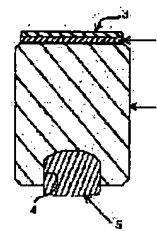
**PATENT ABSTRACTS OF JAPAN**(11)Publication number : **09-206723**(43)Date of publication of application : **12.08.1997**

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**B08B 17/00****G03F 1/14****H01L 21/027**(21)Application number : **08-035536**(71)Applicant : **SHIN ETSU CHEM CO LTD**(22)Date of filing : **30.01.1996**(72)Inventor : **KASHIDA SHU****(54) PELLICLE****(57)Abstract:**

**PROBLEM TO BE SOLVED:** To obtain a pellicle without sticking a liner having a possibility of the appearance of foreign matter by forming a channel-like recessed part on the other end face of a pellicle frame spread with a pellicle film at one end face and disposing a tacky adhesive layer foamable by heating and/or photoirradiation therein.

**SOLUTION:** The pellicle is constituted by spreading the pellicle film 3 via an adhesive layer 2 on one end face (top end face) of the pellicle frame 1 and forming the channel-like recessed part 4 on the other end face (bottom end face) of the pellicle frame 1. The recessed part 4 is internally provided with the tacky adhesive layer 5 foamable by heating and/or photoirradiation so as not to protrude outside from the other end face of the pellicle frame 1 and to bulge outward from the other end face of the pellicle frame 1 at the time of foaming. A silicone based tacky adhesive is used preferably in terms of light resistance and chemical resistance as the tacky adhesive. According to thereto, the liner is not used and, therefore, there is no appearance of the foreign matter from the liner and the degradation in the performance by the foreign matter of the pellicle film 3 is prevented.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] A pellicle film is stretched by the end side of a pellicle frame, and when this invention is further explained in full detail about the pellicle by which the binder layer was formed in the other end side, it relates to the pellicle which does not stick a liner on the above-mentioned binder layer.

[0002]

[Description of the Prior Art] Since the detailed foreign matter which detailed-ization of a pattern was advancing with progress of densification and high integration, and adhered on the photo mask has also come to become the defect of an imprint pattern, in order that a semiconductor device may prevent adhesion of the foreign matter to this photo mask in recent years, equipping a photo mask with a pellicle is performed increasingly widely.

[0003] And generally this pellicle usually stretches a pellicle film with adhesives to the end side of a metal or the pellicle frame made of a resin, forms a binder layer in the other end side of a pellicle frame, and serves as the structure which protected the binder layer at the liner (it is also called a separator) which has a mold-release characteristic.

[0004] After use of this pellicle exfoliates and removes the liner which has a mold-release characteristic, Although what is necessary is just to fix a pellicle to a photo mask by sticking the exposed binder layer to the position of a photo mask (it is also called a reticle) by pressure. Thus, what is necessary is to contain a pellicle in a predetermined container after checking that there is no foreign matter in a pellicle film, and just to pack up by packing severely so that a foreign matter may not mix, in case the manufactured pellicle is shipped.

[0005]

[Problem(s) to be Solved by the Invention] However, the foreign matter may be generated, if packing and packing after conveying a pellicle to the destination are unpacked about this pellicle, a pellicle is taken out and the existence of the foreign matter of a pellicle film is checked.

[0006] It thinks because the foreign matter which was latent in addition to the pellicle film adhered to the pellicle film as this cause by the vibration at the time of the transportation by the truck, the railroad, and the airplane, and shipping and discharging of shipment, or the shock.

[0007] Moreover, as a place where a foreign matter may be latent in addition to a pellicle film, the lateral surface of a pellicle frame and a medial surface, and the liner front face further used for protection of a binder layer can be considered. Since the plastic film which generally coated the release agent is used especially for the liner as a material, it tends to be charged. Consequently, a particle tends to adhere to a liner front face, this particle moves to a pellicle film, and there are a foreign matter and a bird clapper. Furthermore, although it pierces in order to set a liner by the configuration of a frame, and it pierces using an edge, it is easy to generate a foreign matter also from the cross section of the punching portion.

[0008] this invention was made in view of the above-mentioned situation, and aims at offering the pellicle which omitted use of a liner with fear of the above-mentioned foreign matter generating.

[0009]

[A The means for solving a technical problem and the gestalt of implementation of invention] In order to attain the above-mentioned purpose, while the pellicle film is stretched by the end side of a pellicle frame, this invention In the pellicle by which the binder layer for reticle attachment was formed in the other end side of a pellicle frame, while forming a slot-like crevice in the other end side of the above-mentioned pellicle frame The binder layer which can foam by heating and/or optical irradiation in this slot-like crevice is not protruded into the method of outside [ side / pellicle frame other end ]. And the pellicle which has not stuck the liner on the above-mentioned binder layer which prepares so that it may foam by heating and/or optical irradiation and may bulge in the method of outside [ side / pellicle frame other end ], and is characterized by the bird clapper is offered.

[0010] According to this invention, since the binder layer which can foam in a slot-like crevice in this way is formed, protection of the binder layer by the liner is not needed. Moreover, when sticking this pellicle on a reticle, a binder layer is heated and/or irradiated [ optical ], this foams in a binder layer, volume increases, and the binder layer settled in the above-mentioned crevice bulges in the method of outside [ side / pellicle frame other end ], therefore a pellicle pastes a reticle by this bulge binder. Thus, since a liner becomes unnecessary, when according to this invention generating of the foreign matter from a liner is lost, consequently the performance degradation by the foreign matter of a pellicle film can be prevented,

processes, such as washing of the raw material expense of a liner or a liner, punching, and inspection, and costs can be reduced.

[0011] Hereafter, with reference to a drawing, it explains in more detail per this invention.

[0012] As shown in drawing 1, while the pellicle of this invention stretches the pellicle film 3 through the adhesives layer 2 to the end side (upper-limit side) of the pellicle frame 1 So that the slot-like crevice 4 may be formed in the other end side (soffit side) of the pellicle frame 1 and the binder layer 5 which can foam by heating and/or optical irradiation in this crevice 4 may not be protruded into the method of outside [ side / other end / of the pellicle frame 1 ] However, it forms so that it may bulge in the method of outside [ side / other end / of the pellicle frame 1 ] at the time of foaming, as shown in drawing 2.

[0013] Although there is especially no limit and a general rubber system binder and an acrylic binder can also be used as a binder here if foaming by heating and/or optical irradiation is possible, it is desirable to use a silicone system binder at lightfastness and a chemical-resistant point. Moreover, N<sub>2</sub> gas, H<sub>2</sub> gas, CO<sub>2</sub> gas, etc. can be made to foam as a foaming means to foam by heating and/or optical irradiation. When a binder needs bridge formation, for example, after constructing a bridge in a binder by UV irradiation, the means of making it heat and foam etc. can be adopted.

[0014] That to which hydrogen gas is generated and it foams is mentioned by performing dehydrogenation using a platinum system catalyst by the thing which made the resin (for example, Expancel by the Japanese ferrite company) containing an inflating agent gasifiable to a well-known silicone binder as the above-mentioned foaming nature silicone binder contain, or the silicone binder which contains in an end the dimethylpolysiloxane which has a silanol group, and the dimethyl hydrogen siloxane which has a SiH basis.

[0015] Moreover, there is especially no limit about the flute width and the depth of the slot-like crevice in which the above-mentioned binder layer is formed, and its configuration. For example, when the width of face of the other end side of a pellicle frame is 2mm, the other end side perimeter of a pellicle frame can be covered, and the slot which is 0.5-1.5mm width of face can be prepared continuously [ in modes such as the shape of the shape of a straight line, and zigzag, ], or intermittently, and the depth of flute can be set to about 0.5-5mm. The cross-section configuration of the slot can be formed in proper configurations, such as the shape of the shape of a square configuration and a semicircle, and V character.

[0016] Furthermore, as for the binder layer after foaming, it is desirable to decide the amount of the binder before foaming, an expansion ratio, etc. that the apical surface bulges about 0.3-1mm preferably 0.1-3mm from the other end side of a pellicle frame.

[0017] Since according to the pellicle mentioned above a binder layer is in the crevice formed in the other end side of a pellicle before foaming and it has not overflowed from now on, when containing a pellicle in a container, even if there is no liner at the time of each handling in the case of taking out from a container, it is convenient during receipt. Moreover, since volume increases and a binder layer bulges from a pellicle frame other end side by making a binder layer foam, it will be in the state where ablation removal of the liner was carried out in the conventional pellicle, therefore a pellicle can be stuck by pressure and stuck on a photo mask or a reticle like the conventional pellicle.

[0018]

[Example] Although an example is shown and this invention is explained concretely hereafter, this invention is not restricted to the following example.

[0019] [Example] 122x149mm and width of face used the frame made from aluminum 2mm and whose height outside \*\* is 5mm as a pellicle frame. Width of face established continuously the slot-like crevice whose depth is 3mm by 1.2mm for 4 rounds in the center section of the other end side of this frame.

[0020] Next, it was filled up so that a binder might not overflow into an end in the above-mentioned crevice at the frame other end side shell exterior using the non-solvent type silicone system binder which contains the complex of platinum and dimethylpolysiloxane as the dimethylpolysiloxane which has a silanol group, the dimethyl hydrogen siloxane which has a SiH basis, and a catalyst as a binder.

[0021] The thin film of fluorine system polymer was stretched as a pellicle film through adhesives to the end side of this frame, and the pellicle which does not have a liner was produced.

[0022] When put into the container of exclusive use of this pellicle, the truck performed the 500km transportation examination after seal, the pellicle was taken out from the container after the transportation examination and the foreign matter on a pellicle film was measured using the condensing lamp in the dark room, the increase in a foreign matter was not accepted.

[0023] Next, when the above-mentioned binder was heated for 5 minutes at 80 degrees C using the infrared heater, the binder foamed, volume increased (1.4 times as many expansion ratio as this), and the apical surface of a binder became high 0.5mm from the frame other end side. After foaming to a binder, when it was stuck to the glass substrate made from synthetic quartz by pressure for 3 minutes by the pressure of 15kg, the binder layer and the glass substrate pasted up uniformly.

[0024]

[Effect of the Invention] According to this invention, since a liner is not used, there is no generating of the foreign matter from a liner, and the performance degradation by the foreign matter of the pellicle film from this point is prevented, and the process and costs accompanying use of a liner can be reduced.

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**CLAIMS**

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[Claim(s)]

[Claim 1] In the pellicle by which the binder layer for reticle attachment was formed in the other end side of a pellicle frame while the pellicle film was stretched by the end side of a pellicle frame, while forming a slot-like crevice in the other end side of the above-mentioned pellicle frame The binder layer which can foam by heating and/or optical irradiation in this slot-like crevice is not protruded into the method of outside [ side / pellicle frame other end ]. And the pellicle which has not stuck the liner on the above-mentioned binder layer which prepares so that it may foam by heating and/or optical irradiation and may bulge in the method of outside [ side / pellicle frame other end ], and is characterized by the bird clapper.

[Claim 2] The pellicle according to claim 1 in which the binder layer was formed of the foaming nature silicone binder.

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[Translation done.]

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ABSTRACT:

PROBLEM TO BE SOLVED: To obtain a pellicle without sticking a liner having a possibility of the appearance of foreign matter by forming a channel-like recessed part on the other end face of a pellicle frame spread with a pellicle film at one end face and disposing a tacky adhesive layer foamable by heating and/or photoirradiation therein.

SOLUTION: The pellicle is constituted by spreading the pellicle film 3 via an adhesive layer 2 on one end face (top end face) of the pellicle frame 1 and forming the channel-like recessed part 4 on the other end face (bottom end

face) of the pellicle frame 1. The recessed part 4 is internally provided with the tacky adhesive layer 5 foamable by heating and/or photoirradiation so as not to protrude outside from the other end face of the pellicle frame 1 and to bulge outward from the other end face of the pellicle frame 1 at the time of foaming. A silicone based tacky adhesive is used preferably in terms of light resistance and chemical resistance as the tacky adhesive. According to thereto, the liner is not used and, therefore, there is no appearance of the foreign matter from the liner and the degradation in the performance by the foreign matter of the pellicle film 3 is prevented.

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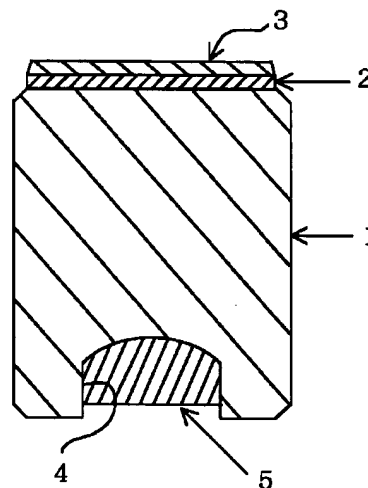
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(54)【発明の名称】 ペリクル

(57)【要約】

【解決手段】 ペリクル棒の一端面にペリクル膜が張設されていると共に、ペリクル棒の他端面にレチクル貼着用粘着剤層が形成されたペリクルにおいて、上記ペリクル棒の他端面に溝状凹部を形成すると共に、この溝状凹部内に加熱及び／又は光照射により発泡可能な粘着剤層をペリクル棒他端面より外方にはみ出さず、かつ加熱及び／又は光照射により発泡してペリクル棒他端面より外方に膨出するように設けてなることを特徴とする上記粘着剤層にライナーを貼付していないペリクル。

【効果】 本発明によれば、ライナーを使用しないので、ライナーからの異物の発生がなく、この点からのペリクル膜の異物による性能の低下が防止され、かつライナーの使用に伴う工程、費用を省くことができる。



## 【特許請求の範囲】

【請求項1】 ペリクル枠の一端面にペリクル膜が張設されていると共に、ペリクル枠の他端面にレチクル貼着用粘着剤層が形成されたペリクルにおいて、上記ペリクル枠の他端面に溝状凹部を形成すると共に、この溝状凹部内に加熱及び／又は光照射により発泡可能な粘着剤層をペリクル枠他端面より外方にはみ出さず、かつ加熱及び／又は光照射により発泡してペリクル枠他端面より外方に膨出するように設けてなることを特徴とする上記粘着剤層にライナーを貼付していないペリクル。

【請求項2】 粘着剤層が発泡性シリコン粘着剤により形成された請求項1記載のペリクル。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、ペリクル枠の一端面にペリクル膜が張設され、他端面に粘着剤層が形成されたペリクルに関し、更に詳述すると、上記粘着剤層にライナーを貼付しないペリクルに関する。

## 【0002】

【従来の技術】近年、半導体装置は高密度化、高集積化の進展に伴ってパターンの微細化が進行しており、フォトリソグラフィ上に付着した微細な異物でも転写パターンの欠陥になるようになってきたことから、このフォトリソグラフィへの異物の付着を防止するためにフォトリソグラフィにペリクルを装着することが広く行われるようになってきている。

【0003】そして、このペリクルは、通常、一般に金属又は樹脂製のペリクル枠の一端面にペリクル膜を接着剤で張設し、ペリクル枠の他端面に粘着剤層を形成し、その粘着剤層を離型性を有するライナー（セパレーターとも称する）で保護した構造体となっている。

【0004】このペリクルの使用は、離型性を有するライナーを剥離して除去した後、露出した粘着剤層をフォトリソグラフィ（レチクルとも称する）の所定の位置に圧着することによってペリクルをフォトリソグラフィに固定すればよいが、このように製造したペリクルを出荷する際には、ペリクル膜に異物がないことを確認後、ペリクルを所定の容器に収納し、異物が混入しないように厳重に包装し、梱包を行えばよい。

## 【0005】

【発明が解決しようとする課題】しかし、このペリクルについてはペリクルを目的地に輸送後、包装・梱包を解きペリクルを取り出してペリクル膜の異物の有無を確認すると異物が発生している場合がある。

【0006】この原因としては、トラックや鉄道、飛行機による輸送時及び出荷の積みおろし時の振動や衝撃により、ペリクル膜以外に潜在していた異物がペリクル膜に付着したためと考えられる。

【0007】また、ペリクル膜以外に異物が潜在する可能性のある場所としては、ペリクル枠の外側面及び内側

面、更に粘着剤層の保護に用いているライナー表面が考えられる。特にライナーは、一般に離型剤をコーティングしたプラスチックフィルムを材料として用いているため帯電し易い。その結果、ライナー表面に微粒子が付着し易く、この微粒子がペリクル膜に移り、異物となることがある。更に、ライナーは、フレームの形状に合わせるために打ち抜き刃を用いて打ち抜くものであるが、その打ち抜き部分の断面からも異物が発生し易い。

【0008】本発明は上記事情に鑑みなされたもので、上記異物発生のおそれがあるライナーの使用を省略したペリクルを提供することを目的とする。

## 【0009】

【課題を解決するための手段及び発明の実施の形態】本発明は、上記目的を達成するため、ペリクル枠の一端面にペリクル膜が張設されていると共に、ペリクル枠の他端面にレチクル貼着用粘着剤層が形成されたペリクルにおいて、上記ペリクル枠の他端面に溝状凹部を形成すると共に、この溝状凹部内に加熱及び／又は光照射により発泡可能な粘着剤層をペリクル枠他端面より外方にはみ出さず、かつ加熱及び／又は光照射により発泡してペリクル枠他端面より外方に膨出するように設けてなることを特徴とする上記粘着剤層にライナーを貼付していないペリクルを提供する。

【0010】本発明によれば、このように溝状凹部内に発泡可能な粘着剤層を形成してあるため、ライナーによる粘着剤層の保護を必要としない。また、このペリクルをレチクルに貼着する場合は、粘着剤層を加熱及び／又は光照射するもので、これにより粘着剤層は発泡して体積が増加し、上記凹部内に納まっていた粘着剤層がペリクル枠他端面より外方に膨出し、従ってこの膨出粘着剤によりペリクルがレチクルに接着されるものである。このように、本発明によれば、ライナーが不要になるため、ライナーからの異物の発生がなくなり、その結果、ペリクル膜の異物による性能の低下が防止できる上、ライナーの原料費やライナーの洗浄、打ち抜き、検査等の工程、費用を省くことができる。

【0011】以下、本発明につき図面を参照して更に詳しく説明する。

【0012】本発明のペリクルは、図1に示したように、ペリクル枠1の一端面（上端面）に接着剤層2を介してペリクル膜3を張設すると共に、ペリクル枠1の他端面（下端面）に溝状凹部4を形成し、この凹部4内に加熱及び／又は光照射により発泡可能な粘着剤層5をペリクル枠1の他端面より外方にはみ出さないように、しかし図2に示したように発泡時にペリクル枠1の他端面より外方に膨出するように形成する。

【0013】ここで、粘着剤としては、加熱及び／又は光照射により発泡可能であるものであれば特に制限はなく、一般のゴム系粘着剤やアクリル系粘着剤を用いることもできるが、耐光性、耐薬品性の点でシリコン系粘



着剤を用いることが好ましい。また、加熱及び／又は光照射により発泡する発泡手段としては、 $N_2$ ガス、 $H_2$ ガス、 $CO_2$ ガス等を発泡させることができる。粘着剤が架橋を必要とする場合は、例えばUV照射により粘着剤を架橋した後、加熱して発泡させるなどの手段を採用することができる。

【0014】上記発泡性シリコン粘着剤としては、公知のシリコン粘着剤にガス化可能な膨張剤を含む樹脂（例えば日本フェライト社製エクспанセル）を含有させたもの、または末端にシラノール基を有するジメチルポリシロキサンとSiH基を有するジメチルヒドロジェンシロキサンを含むシリコン粘着剤で白金系触媒を用いて脱水素反応を行うことにより、水素ガスを発生させて発泡するものが挙げられる。

【0015】また、上記粘着剤層が形成される溝状凹部の溝幅や深さ、その形状については特に制限はない。例えば、ペリクル枠の他端面の幅が2mmである場合、0.5～1.5mm幅の溝をペリクル枠の他端面全周に亘って直線状又はジグザグ状などの態様で連続的又は間欠的に設けることができ、また溝の深さは0.5～5mm程度とすることができる。その溝の断面形状は四角形状、半円状、V字状など適宜な形状に形成できる。

【0016】更に、発泡後の粘着剤層は、その先端面がペリクル枠の他端面より0.1～3mm、好ましくは0.3～1mm程度膨出するように発泡前の粘着剤の量、発泡倍率などを決めることが好ましい。

【0017】上述したペリクルによれば、発泡前は粘着剤層はペリクルの他端面に形成された凹部内にあり、これからはみ出していないので、ペリクルを容器に収納する場合、収納中、容器より取り出す場合の各ハンドリング時にライナーがなくても支障はない。また、粘着剤層を発泡させることにより、体積が増大し、粘着剤層はペリクル枠他端面より膨出するので、従来のペリクルにおいてライナーを剥離除去した状態となり、従って従来のペリクルと同様にペリクルをフォトマスク又はレチクルに圧着して貼り付けることができる。

【0018】

【実施例】以下、実施例を示し、本発明を具体的に説明するが、本発明は下記の実施例に制限されるものではない。

【0019】〔実施例〕ペリクル枠として外寸が122

×149mm、幅が2mm、高さが5mmのアルミニウム製フレームを用いた。このフレームの他端面の中央部に四周に亘って幅が1.2mmで深さが3mmの溝状凹部を連続的に設けた。

【0020】次に、粘着剤として末端にシラノール基を有するジメチルポリシロキサンとSiH基を有するジメチルヒドロジェンシロキサン及び触媒として白金とジメチルポリシロキサンとの錯体を含有する無溶剤型シリコン系粘着剤を用いて、上記凹部内に粘着剤がフレーム他端面から外部にはみ出さないように充填した。

【0021】このフレームの一端面に接着剤を介してフッ素系ポリマーの薄膜をペリクル膜として張設し、ライナーを有しないペリクルを作製した。

【0022】このペリクルを専用の容器に入れて密封後、トラックにより500kmの輸送試験を行い、輸送試験後、ペリクルを容器から取り出し、ペリクル膜上の異物を暗室内で集光ランプを用いて測定したところ、異物の増加は認められなかった。

【0023】次に、赤外線ヒーターを用いて上記粘着剤を80℃で5分間加熱したところ、粘着剤が発泡して体積が増加し（発泡倍率1.4倍）、粘着剤の先端面がフレーム他端面より0.5mm高くなった。粘着剤を発泡後、合成石英製ガラス基板に圧力15kgで3分間圧着したところ、粘着剤層とガラス基板が均一に接着した。

【0024】

【発明の効果】本発明によれば、ライナーを使用しないので、ライナーからの異物の発生がなく、この点からのペリクル膜の異物による性能の低下が防止され、かつライナーの使用に伴う工程、費用を省くことができる。

【図面の簡単な説明】

【図1】本発明の一実施例を示す粘着剤層発泡前の断面図である。

【図2】本発明の一実施例を示す粘着剤層発泡後の断面図である。

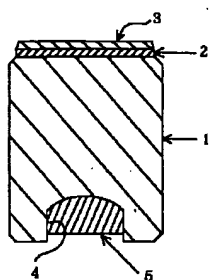
【符号の説明】

- 1 ペリクル枠
- 2 接着剤層
- 3 ペリクル膜
- 4 溝状凹部
- 5 粘着剤層

(4)

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【図1】



【図2】

